

Claims

1. *(Currently amended)* A magnetic recording disk comprising:
 - a substrate;
 - a first lower ferromagnetic layer on the substrate and having a remanent magnetization M_r , a thickness t and a remanent-magnetization-thickness product M_{rt} ;
 - a first antiferromagnetically coupling layer on the first lower ferromagnetic layer;
 - a second lower ferromagnetic layer on the first antiferromagnetically coupling layer and having an M_{rt} less than the M_{rt} of the first lower ferromagnetic layer;
 - a second antiferromagnetically coupling layer on the second lower ferromagnetic layer;
 - a third lower ferromagnetic layer on the second antiferromagnetically coupling layer and having an M_{rt} greater than the M_{rt} of the second lower ferromagnetic layer;
 - a third antiferromagnetically coupling layer on the third lower ferromagnetic layer; and
 - an upper ferromagnetic layer on the third antiferromagnetically coupling layer and having an M_{rt} greater than the sum of the M_{rt} values of the first and third lower ferromagnetic layers.

9. *(Currently amended)* A magnetic recording disk comprising:
a substrate; and
an antiferromagnetically-coupled structure on the substrate and having
two remanent magnetic states in the absence of an applied magnetic field, the
structure comprising
(a) a first lower ferromagnetic layer having a remanent magnetization
Mr, a thickness t and a remanent-magnetization-thickness product Mrt; (b) a
first antiferromagnetically coupling layer on the first lower ferromagnetic
layer; (c) a second lower ferromagnetic layer on the first
antiferromagnetically coupling layer and having an Mrt less than the Mrt of
the first lower ferromagnetic layer; (d) a second antiferromagnetically
coupling layer on the second lower ferromagnetic layer; (e) a third lower
ferromagnetic layer on the second antiferromagnetically coupling layer and
having an Mrt greater than the Mrt of the second lower ferromagnetic layer;
(e) (f) a third antiferromagnetically coupling layer on the third lower
ferromagnetic layer; and (f) (g) an upper ferromagnetic layer on the third
antiferromagnetically coupling layer and having an Mrt greater than the sum
of the Mrt values of the first and third lower ferromagnetic layers;
and wherein the magnetization directions of the upper ferromagnetic
layer and the third ferromagnetic layer are substantially antiparallel in each
remanent state, the magnetization directions of the second lower
ferromagnetic layer and the first ferromagnetic layer are substantially
antiparallel in each remanent state, and the magnetization direction of the
upper ferromagnetic layer in one remanent state is substantially antiparallel to
its magnetization direction in the other remanent state.